Remarks:

The March 5, 2004 Official Action has been carefully considered. In view of the amendments submitted herewith and these remarks, favorable reconsideration and allowance of this application are respectfully requested.

At the outset, it is noted that a shortened statutory response period of three (3) months was set in the March 5, 2004 Official Action. The initial due date for response, therefore, was June 5, 2004. A petition for a two (2) month extension of the response period is presented with this amendment and request for reconsideration, which is being filed before the expiration of the two (2) month extension period.

It is further noted that the examiner has determined that the currently pending claims, 1-32, have unity of invention. Claims 1-32 have accordingly been rejoined for purposes of examination.

A number of specification and claim objections are noted in paragraphs 2-9 of the March 5, 2004 Official Action. These objections are believed to be overcome by the present amendment, which includes proper identification of TWEEN 20 as a trademark (together with generic terminology) consistent capitalization and correction of misspellings. In addition, claim 32 has been amended so as to be dependent from claim 1, rather than claim 8.

Turning to the substantive aspects of the March 5, 2004 Official Action, claims 1-32 stand rejected for allegedly failing to comply with the written description requirement of 35 U.S.C. §112, first paragraph. Specifically, the Examiner asserts in this regard that the examples provided in the specification do not describe the application of untreated samples to beads, whereby nucleic acid is isolated, without the performance of an additional extraction step, and that the specification fails to adequately disclose (i) pores of dimensions other than 1 to 150 microns; (ii) alternative

embodiments of a by-pass channel; and (iii) the pore size, composition, thickness and cut-away sections of membranes.

Claims 1-25 and 32 have been further rejected as allegedly failing to satisfy the enablement requirement of 35 U.S.C. §112, first paragraph. Although it is acknowledged that the present specification is enabling for the isolation of nucleic acid from a human serum sample, wherein such sample has been treated so as to release DNA from isolated nuclei prior to the nucleic acid being bound by porous beads, the Examiner contends that the specification does not reasonably provide enablement for the isolation of any nucleic acid from any sample wherein any device is used. Consequently, the Examiner concludes that the specification does not enable any person skilled in the art to make and use the invention commensurate in scope with the currently pending claims. Particular areas in which the present specification's disclosure is considered inadequate are identified in paragraphs 22-25 of the March 5, 2004 Official Action.

Claims 30 has been rejected under 35 U.S.C. §112, second paragraph as allegedly indefinite, with reference to the recitation of "aerosol plug".

Claims 1-24 and 26-32 have also been rejected as allegedly anticipated under 35 U.S.C. §102(v) or, in the alternative, as allegedly obvious under 35 U.S.C. §103(a), in view of the disclosure of Gibco BRL Products and Reference Guide (Gibco, pages 19-41 to 19-44 (1997)).

The foregoing objections and rejections constitute all of the grounds set forth in the March 5, 2004 Official Action for refusing the present application.

In accordance with the present amendments independent claims 1, 25, 26 and 31 are amended to recite that the liquid mixture comprises a biological or a biochemical sample. Biological samples find support at page 1, lines 4, and 5; page 2, line 26; page 3, line 12; and Examples 1, 2, 4-6, 10, 12, 13 and 15. Biochemical samples are supported in the

present specification at page 1, lines 6-7; page 2, lines 21-22; and Examples 3, 11 and 14.

Claim 17 is now amended so that it is dependent on claim 1, to remove the limitation to beads, and to correct the spellings of the words "pyrimidine" and "imines". See page 5, line 22 of the specification. That the limitation to beads is not necessary finds support at page 5, lines 20-21.

Dependent claim 32 is amended so that it is directed to the method of claim 1, wherein the solid phase has surface groups having a pKa such that the charge of the solid phase and its capability of binding nucleic acid varies with pH. Support for this amendment is provided at page 5, lines 13-30 of the present specification.

The present amendment includes new independent method claims 33 to 37, as well as new claims 38 and 39, directed to the extraction device. These independent claims are based on the existing independent claims 1 and 26, with additional features incorporated from the original dependent claims or the description.

Method claim 33 recites that the container is a pipette, and the solid phase is located in the tip of the pipette. This is exemplified by the arrangement shown in Fig. 3 and used in examples 2 and 5. The advantage of this pipette arrangement is that it is compact, and can readily be used with deep well plates, microtitre plates or PCR tubes, or with centrifugation or vacuum manifolds. See page 6, line 29 to page 7, line 6 of the specification.

Claims 34 and 35 recite that the container is an extraction cartridge, which is releasably connected to one end of the reversible suction means (e.g. syringe). This arrangement is exemplified in Examples 1, 3, 4, 6 and 7 to 14. An advantage of using a cartridge is that if it does become contaminated, it may be disposed of, and any contamination is retained within the cartridge, preventing contamination of interfaces with the remainder of the instrumentation. See

page 4, lines 4-8 of the specification.

Claim 35 also recites that the inner surface of the extraction cartridge has ridges or spirals to cause mixing between the liquid mixture and the solid phase. The solid phase may move inside the cartridge, which is useful to avoid clogging when smaller solid phase beads are employed. Providing the inner surface of the cartridge with ridges or spirals generates a mini fluidized bed to facilitate mixing and binding of nucleic acids within the crude sample to the solid phase. See page 8, line 27, to page 9, line 2 of the specification. Thus mixing between liquid mixture and solid phase is improved.

Claim 36 recites that the solid phase has surface groups having a pKa such that the charge of the solid phase and its capability of binding nucleic acid varies with pH. This feature finds support at page 5, lines 13 to 30, and relates to "charge-switch" technology, in which the surface pKa of the solid phase dictates the charge of the surface (and therefore whether or not it binds nucleic acids) at certain pHs. Thus, the solid phase can be manipulated by pH to turn e.g. a positive charge (and hence the nucleic acid binding capability) on or off. Thus nucleic acids can bind to the solid phase at a certain pH, and then elute at a different pH, which facilitates purification.

Claim 37 recites that the solid phase comprises a porous plug, wadding, frit membrane or mesh. This is supported at page 4, lines 27 and 30; page 6, line 22; and page 7, line 1 of the present specification. These porous filters further facilitate passage of e.g. particulate, viscous material and cellular debris in order to reduce blocking and contamination to a minimum, aiding the direct extraction of nucleic acids from a crude sample.

Claims 38 and 39 are directed to the syringe extraction device, and the pipette extraction device respectively, and recite the additional feature that the solid phase has surface

groups having a pKa such that the charge of the solid phase and its capability of binding nucleic acid varies with pH, support for which has previously been cited.

Each of the new independent claims 33 to 39 contain unique combinations of features which facilitate the direct and easy extraction of nucleic acids from crude samples as described herein.

No new matter has been introduced into this application by reason of any of the amendments presented herewith. Moreover, none of the present claim amendments is believed to constitute a surrender of any originally claimed subject matter in order to establish patentability. The effect of these amendments is merely to make explicit that which was implicit in the claims as originally worded.

For the reasons set forth below, applicant respectfully submits that each ground of rejection set forth in the March 5, 2004 Official Action either lacks merit or cannot be maintained in view of the present amendments. These grounds of rejection are, therefore, respectfully traversed.

A. Claims 1-32 and Newly Added Claims 33-39 Fully Comply With the Written Description Requirement of 35 U.S.C. §112, First Paragraph

The relevant inquiry in determining compliance with the written description requirement of 35 U.S.C. §112,first paragrpah, is whether the specification reasonably conveys to a person ordinary skill in the relevant art that applicant, at the time the application was filed, had possession of the claimed subject matter. In re Kaslow, 217 U.S.P.Q. 1089 (Fed. Cir. 1983).

Furthermore, the Examiner has the initial burden of presenting evidence or reasons why a person of ordinary skill in the art would not recognize in applicant's specification disclosure a description of the invention defined by the claims. Ex parte Sorenson, 3 U.S.P.Q.2nd 1462 (Bd. App.

1987).

As noted above, the independent claims now recite that the liquid mixture comprises a biological or a biochemical sample. Biological samples are supported on page 1, lines 4, and 5; page 2, line 26; page 3, line 12; and Examples 1, 2, 4-6, 10, 12, 13 and 15. Biochemical samples (e.g. samples taken from biochemical reaction mixtures or analytical processes) are supported on page 1, lines 6-7; page 2, lines 21-22; and Examples 3, 11 and 14. Therefore, the specification exemplifies the different types of liquid mixtures from which nucleic acids may be extracted using the method and device of the present invention.

In paragraph 14 of the Official Action, the examiner asserts that the examples do not describe the application of untreated sample to beads whereby DNA or RNA is isolated, without the performance of an additional "extraction step". The examiner's position appears to be based on the erroneous belief that in the present invention, nuclei, not nucleic acids, are isolated on the solid phase, and that the sample must be "treated", prior to the nucleic acid being bound, in order to release DNA from isolated nuclei. However, in Examples 3, 11 and 14, the samples are taken directly from biochemical reaction mixtures, e.g. a PCR reaction in Example 11, and a plasmid alkaline lysis preparation in Example 3. In these particular embodiments of the invention, there is no additional "treatment" or "extraction step". On the contrary, in each case the nucleic acids are immobilized on the solid phase directly from the liquid mixture, as the nucleic acids are "free" in the biochemical reaction mixture, rather than bound in nuclei. Thus, an additional "extraction step" is certainly not essential to the practice of the invention, as exemplified in the present specification.

Moreover, at no point does the specification state that the presence of cells or nuclei in the liquid mixture is a prerequisite. Therefore, limiting the extraction method in

this way would be an unwarranted restriction in the scope of the claims.

Furthermore, the examiner states (paragraph 14) that the specification describes extracting DNA from blood samples, but not from different types of samples such as crude oil, bone or plant material, or more viscous samples. However, the specification describes in detail how the extraction method and device of the present invention can be applied to a wide range of different types of samples. For example, samples containing higher levels of particulate matter, viscous material or cellular debris may first be homogenized to release the nucleic acids. This is done in example 12, wherein RNA is extracted from liver, after homogenizing the liver in a dilution buffer. Such a method could easily be applied to the various types of samples mentioned by the examiner, such as plant material or bone material. Indeed, the specification at page 3, lines 9 to 20 describes other ways of dealing with difficult samples (e.g. plant material), such as shredding or maceration, and flocculation and sedimentation.

Dilution techniques may also be used to deal with especially viscous samples (as in Examples 1 and 2, in which whole blood is diluted) and lysis techniques may be used to deal with cellular debris and to release nucleic acids from cellular samples (as in Example 4).

Additionally, it is explained at page 7, lines 15-19 that the solid phase can incorporate holes of, e.g. 0.1 mm diameter or greater, to minimize blocking and allow passage of crude matter.

Finally, the "reverse flow" of the present extraction method forces any debris, particulate, viscous matter, and other waste starting materials back out of the solid phase in the reverse direction, so that it is easily disposed of, (while leaving the nucleic acids immobilized on the solid support, as disclosed at page 2, lines 26 to 30).

Thus, the specification describes in detail how the extraction method of the present invention is applied to many different types of biological samples, and samples taken from biochemical reaction mixtures, having different viscosities, concentrations and physical properties.

The examiner further alleges that the specification does not adequately describe (i) pores of dimensions other than 1 to 150 microns (paragraph 15), (ii) alternative embodiments of a by-pass channel (paragraph 16), and (iii) the pore size, composition, thickness and cut-away sections of membranes (paragraph 17). However, it is explained at page 5, lines 6 to 11 of the specification that porous beads may be used to avoid clogging and maintain high flow rates, the mention of pore diameters of 150 microns, and 1-20 microns being mere examples. On the other hand, page 7 describes porous polyethylene, plastic, cellulose or glass with pores "large enough to allow passage of crude matter", emphasising the function of the pores. Moreover, pore sizes of "20 microns or larger" and "1 to 200 microns" are exemplified (page 7, lines 14-16), and larger pores of "0.1 mm or greater" may be used "to avoid blocking" (page 7, lines 17-18). Thus, various pore sizes and structures, including those outside the diameter range of 1-150 microns, are expressly disclosed in the specification, and their function is emphasized. Therefore, the feature of claim 20, for example, wherein the frit, porous membrane or mesh has a pore diameter of at least 0.1 mm is more than adequately described. It necessarily follows that a person skilled in the art would recognize that, as of the filing date of the present application, the applicant was in possession of the concept of using pores of various sizes to minimize blockage by crude matter. Clearly, the pore size actually selected would depend on the type of samples to be analysed and the size of the crude matter particles in such samples.

Similarly, there is described at page 8, lines 16-17, the concept of using a by-pass channel, when smaller solid phase beads are used, in order to allow larger particles or debris to pass up and down without clogging the cartridge. Glass beads of less than 100 microns are mentioned merely as an illustrative example of such "smaller solid phase beads", and it is evident that a person skilled in the art would recognize from this disclosure that a by-pass channel with other, different solid phases could be used in practicing applicant's invention. In addition, page 8, lines 18-20 gives two different examples of a by-pass channel, namely (i) a small tube that bypasses the solid phase, and (ii) a (different) porous material with larger pores (e.g. 20 microns or greater), that surrounds the solid phase (as shown in Fig. 5). Thus the specification conveys to a person skilled in the art that the applicant was in possession of different embodiments of the by-pass channels (such as those embodiments exemplified) in order to fulfill the function of allowing larger particles or debris to pass up and down without clogging the cartridge.

Finally, regarding the discs or membranes claimed in claim 22, the specification, at page 7, line 17, mentions the necessity for larger holes in order to avoid blockage of the membrane by particles or debris. A hole diameter of at least 0.1 mm is exemplified, and the disclosure goes on to explain that the hole may be in the middle of or part of a cut away section. Again, a person skilled in the art would recognize that the applicant was in possession of the concept of using pores and cut away sections of various sizes to minimize blockage of the membranes by crude matter. Any skilled person would realize that the pore size (or size of a cut away section) actually employed would depend on the type of samples to be analyzed and the size of the crude matter particles in these samples. Similarly, appropriate materials with which to fabricate the membrane would be apparent to any person skilled

in the art, and a few of these materials are described at page 7, lines 13-15, and page 5, lines 13-14 of the present specification.

Inasmuch as the specification clearly conveys to those skilled in the art that the applicant was in possession of the presently claimed invention as of the date this application was filed, the rejection of claims 1-32 for failing to comply with the written description requirements of 35 U.S.C. §112, first paragraph, is untenable and should be withdrawn.

B. Claims 1-25, 32 and New Claims 33-39 Satisfy the Enablement Requirement of 35 U.S.C. §112, First Paragraph

In paragraph 19 of the Official Action, the examiner contends that the specification does not provide enablement for the isolation of any nucleic acid from any sample wherein any device is used. Rather, the examiner appears to have the erroneous belief that the specification merely enables isolation of nucleic acid from a human serum sample that has been treated, in order to release nucleic acid from isolated nuclei, before the nucleic acid is bound to the solid phase.

Firstly, however, the specification describes in detail how the extraction method and device of the present invention can be applied to a wide range of different types of samples (see above reply to lack of written description requirement rejection), including samples from biochemical reactions (see Examples 3, 11 and 14) and samples containing higher levels of particulate matter, viscous material or cellular debris (see Example 12). Such samples, may include non-human samples, plant material and bone tissue. Therefore, given the breadth and generality of applicant's disclosure of his invention, it would involve no more than routine experimentation for the skilled person to apply the claimed methods to extract nucleic acids from other (e.g. non-human) cell sources. Moreover, it would be fundamentally unfair to limit the scope of the claims

to extraction of nucleic acid from human serum samples.

Secondly, the presence of cells, or nuclei, and extraction of nucleic acid therefrom, is not a prerequisite. Indeed, in Examples 3, 11 and 14, the samples are taken directly from biochemical reaction mixtures, in which the nucleic acids are "free" rather than bound within nuclei.

Therefore, to limit the claimed methods to those in which the sample is treated prior to nucleic acid being bound, in order to release DNA from isolated or "captured" nuclei, would clearly constitute as unwarranted restriction in the scope of the claims, as it is clear that this is not an essential step in the claimed methods. Moreover, in other examples, such as Examples 5 and 12, the reagents used lyse the cells and nuclei, and the nucleic acids bind directly to the solid phase. Thus, nuclei are not necessarily "captured" on the solid phase and subsequently treated to extract nucleic acids therefrom. Indeed, only the most routine sort of experimentation (if it can accurately be characterized as "experimentation") is required to perform the claimed methods in cases where it is unnecessary to pre-treat the sample to release nucleic acids from bound nuclei.

The examiner further contends in support of this ground of rejection that the claimed method could be designed and operated such that reversal of fluid flow would elute not only the nucleic acid immobilized within the cartridge, but also the contaminants, which the Examiner intimates would somehow be trapped "on the lower aspect of the cartridge". It is noteworthy in this regard that the specification plainly discloses, in cases in which the nucleic acids are immobilized on the solid phase support, that the "cellular debris or contaminants pass up and down to waste leaving the nucleic acids immobilized on the solid phase support". See page 2, lines 29 and 30 of the present specification. Furthermore, all of the applicant's method claims call for extracting nucleic acid from a liquid mixture containing same.

It has long been recognized that where, as in this case, the claims state the objective sought to be achieved, together with the process steps employed to achieve such objective, the use of materials or conditions which might, under certain speculative circumstances, prevent achievement of the objective can hardly be within the scope of the claims. In re Geerdes, 180 U.S.P.Q. 789,793 (C.C.P.A. 1974). Argument based on such speculative assumptions does not constitute a valid basis for an inadequate enablement rejection. Id.

Finally, in response to paragraph 21 of the Official Action, the specification describes the use of positively charged electrodes or meshes to bind and isolate nucleic acids from crude extracts. Turning off or reversing the charge releases the purified nucleic acids. This is discussed at page 4, line 26 to page 5, line 4. A reproducible procedure is described in Example 15 (page 15), in which DNA, in a specified sample of diluted whole blood, was captured on the outside of dialysis tubing surrounding a positively charged electrode, after a 1 hour incubation period. The purified DNA was removed by elution with water. There is no apparent reason why the skilled person would not be able to perform this nucleic acid purification procedure without undue experimentation.

Furthermore, mitochondrial nucleic acid can be extracted using essentially the same procedure described in the specification for extraction of nucleic acids from other source materials.

In summary, it is respectfully submitted that the specification enables any person skilled in the art to make and use the full scope of the claimed invention without undue experimentation. That being the case, the 35 U.S.C. §112, first paragraph rejection of claims 1-25 and 32, based on inadequate enablement, is improper and should be withdrawn.

C. Claim 30 is Not Indefinite When Properly Considered in Light of The Supporting Disclosure in The Specification

The relevant inquiry in determining compliance with the definiteness requirement of 35 U.S.C. §112, second paragraph, is whether the claim in question sets out and circumscribes a particular area with a sufficient degree of precision and particularity, such that the metes and bounds of the claimed invention are reasonably clear. In re Moore, 169 U.S.P.Q. 236 (C.C.P.A. 1971).

The definiteness of claim language may not be analyzed in the abstract, but must be considered in light of the supporting specification, with the language in question being accorded the broadest reasonable interpretation consistent with its ordinary usage in the art. In re Morris, 44 U.S.P.Q.2d. 1023, 1027 (Fed. Cir, 1997). See also Ex parte Cole, 223 U.S.P.Q. 94 (Bd. Apps. 1983) (claims are addressed to the person of ordinary skill in a particular art; compliance with §112 must be adjudged from that perspective, not in a vacuum).

Furthermore, it has long been held that the initial burden of establishing a failure to comply with 35 U.S.C. §112, second paragraph, rests upon the examiner. In rejecting a claim for alleged indefiniteness, therefore, it is incumbent upon the examiner to establish that one having ordinary skill in the art would not have been able to ascertain the scope of protection defined by the claim when read in light of the supporting specification. Ex parte Cordova, 10 U.S.P.Q.2d. 1949, 1952 (PTO B.P.A.I. 1988).

When the appropriate procedural approach is followed in assessing the claim terminology at issue, in accordance with the above-noted authorities, it is beyond question that applicant has satisfied the definiteness requirement of §112, second paragraph, with respect to the subject matter of claim 30.

The operation of the extraction device shown in Fig. 3

is described in the specification at page 10, lines 20-30. Nucleic acid becomes adsorbed on the plug of adsorbent material (18) by means of suction and pressure applied, e.g. by the mouth of the user, on the open end of the pipette. The function of the plug (16), which is the aerosol plug, is to prevent contamination. As further explained at page 13, lines 3-5 the non-derivatized plug, i.e. plug 16, acts as an aerosol and liquid barrier to prevent contamination of the pipette.

It is beyond question that any person of ordinary skill in the art, having applicant's above-noted disclosure and claim 30 before him or her would be apprised to a reasonable degree of certainty as to the exact subject matter encompassed by claim 30. Nothing more is required under 35 U.S.C. §112, second paragraph.

For all of the foregoing reasons, it is clear that in the present case, the examiner has failed to satisfy the PTO's burden of proof with respect to the §112, second paragraph of claim 30 as set forth in the March 5, 2004 Official Action. Accordingly, this ground of rejection is improper and should be withdrawn.

D. The Gibco Reference Neither Anticipates Nor Renders Obvious the Subject Matter of Claims 1-24, 26-32 or New Claims 33-39

Before addressing the specific grounds of rejection based on prior art, a brief review of applicant's invention may be helpful in order to focus on those aspects of the invention which are believed to constitute patentable distinctions over the references of record.

The methods and devices of this invention facilitate the extraction of nucleic acid onto a solid phase directly from a crude liquid mixture comprising a biological or biochemical sample, and improve binding of the nucleic acid to the solid phase. In doing this, contamination of the extraction device (and its solid phase) by the crude mixture

is minimized, and easy disposal of waste starting material is realized.

All this is achieved by an extraction method and device in which the crude mixture is drawn onto and through the solid phase in one direction, and then forced back across the solid phase in the other direction.

This makes for a quick and easy extraction process in which the "reverse flow" prevents the crude sample clogging the solid phase so that the sample is free to flow through it. The reverse flow also increases exposure of the nucleic acid to the solid phase, because the liquid takes more than one "route" (in more than one direction) through the solid phase. Thus better mixing improves nucleic acid binding to the solid phase. Additionally, an increased amount of solid phase is exposed to the nucleic acid due to the prevention of clogging and blockage in or around the solid phase. In this way, nucleic acid binding is improved and extraction of nucleic acid directly from a crude mixture is facilitated.

The liquid mixture may include, for example, biological sample such as a blood sample of lysed cells containing the target nucleic acid (see Example 1), a buccal scrape for buccal cell DNA (see Example 5), or a sample of homogenized liver for extraction of RNA therefrom (see Example 12). Such starting materials contain particulates (e.g. solid liver, blood and buccal scrape fractions), cellular debris (e.g. as a result of lysis of the cells containing the target nucleic acid) and viscous fluid, and the present invention is used to extract nucleic acids directly from samples containing such materials, as demonstrated in the examples. Alternatively, the liquid mixture may include a biochemical sample, for example a sample from a biochemical reaction mixture, e.g. a PCR reaction (Examples 11 and 14), or a plasmid alkaline lysis preparation (Example 3).

In prior art methods, the nucleic acid sample is either passed through the solid phase under gravity (which is an

extremely slow process due to the clogging and blockages caused by the particulates, debris and viscous material), or forced through the solid phase in only one direction by applying pressure in an attempt to speed up the process. The latter not only retards the extraction process by forcing more blockages, and increasing flow-through time, but also interferes with extraction itself, so that less nucleic acid binding occurs. This is because less of the nucleic acid is exposed to the solid phase due to the blockages in or around the solid phase, and because the liquid sample takes only a "single route" (in one direction) through the solid phase. Thus fewer nucleic acid molecules are extracted.

Moreover, crude starting materials easily contaminate conventional equipment because blockages occur which cannot be reversed, because there is no "reverse flow" to force the debris, particulate, and viscous matter back out of the equipment.

Therefore, when prior art equipment is used, the nucleic acid samples require increased pre-treatment to remove debris, particulate, and viscous matter. By contrast, when using the present invention waste starting material is forced back out of the solid phase in the reverse direction, so that it is easily disposed of, leaving the nucleic acids immobilized on the solid support (see page 2, lines 26 to 30).

In summary, the present invention not only improves binding of nucleic acid to a solid phase directly from a crude starting material, but also speeds-up the extraction process, minimizes contamination of the extraction equipment, and facilitates disposal of waste starting material.

Because the reference cited herein as evidence of unpatentability neither teaches nor suggests the essential aspects of applicant's nucleic acid extraction methods and devices and their attendant advantages, as briefly outlined above, the cited reference fails to provide a proper basis for rejecting applicant's claims, as the following discussion will

clearly demonstrate.

Rejections under 35 U.S.C. §102 are proper only when the claimed subject matter is identically disclosed or described in the allegedly anticipatory prior art reference. In re Arkley, 172 U.S.P.Q. 524 (C.C.P.A. 1972). Applying this rule of law to the present case, the 35 U.S.C. §102(b) rejection of claims 1-24 and 26-32 based on the Gibco reference is improper because the subject matter of those claims is nowhere identically disclosed or described in the cited reference.

The Gibco reference does not anticipate applicant claims, firstly because it does not disclose a method in which the nucleic acid sample is drawn through the solid phase in one direction, and then forced over the solid phase in the reverse direction. In other words, the Gibco reference does not teach that a nucleic acid sample is reversibly drawn over the solid phase. Therefore, method claims 1 and 31 and the claims that depend therefrom are novel with respect to the Gibco reference.

Secondly, the Gibco reference does not describe an extraction device in which a reversible suction means operates to draw the liquid mixture through the solid phase in one direction, and force the liquid through the solid phase in the reverse direction, thereby causing the liquid mixture to pass up and down through the solid phase.

The examiner points out in paragraphs 31 to 34 of the March 5, 2004 Official Action that the Gibco reference mentions a "filter-syringe format for rapid oligo(dT) cellulose isolation of mRNA" (which is said to be designed for "cells or tissue"), a microcentrifuge "spin cartridge" system, and other DNA isolation systems. However, nowhere does the Gibco reference describe a nucleic acid sample being reversibly drawn over a solid phase.

As stated above, in prior art systems, the nucleic acid sample is either passed through the solid phase under gravity,

or forced through it in only one direction, by applying pressure, in an attempt to speed the process up. An example is the "Poly(A) Quick® mRNA Isolation Kit" described in the Stratagene Cloning Systems Catalog, 1993, which was cited by the examiner in the Official Action dated July 22, 2003.

There is nothing to indicate that the "filter-syringe format" of Gibco, for example, is used any differently from other prior art systems. Syringes can easily admit an mRNA sample onto a filter, cartridge or solid phase, so that the mRNA may pass through the solid phase under gravity. Similarly, syringes may be connected to filters as a means to apply pressure and force an mRNA sample through the filter in one direction. These known methods all share the disadvantages described above.

In summary, there is nothing in the Gibco reference to show that this "filter-syringe format", "spin cartridge" or any of the other systems disclosed in the Gibco reference, employ reversible suction means, operating to draw the liquid mixture through the solid phase in one direction, and force the liquid through the solid phase in the reverse direction, thereby causing the liquid mixture to pass up and down through the solid phase.

Inasmuch as the Gibco reference fails to identically disclose or describe all of the claim recitations of applicant's claims 1-24 and 26-32, the §102(b) rejection of those claims based on the Gibco references untenable and should be withdrawn.

Given the recitations in applicant's claims that serve to distinguish over the cited Gibco reference, as noted above, the 35 U.S.C. §103(a) rejection of claims 1-26 and 26-32 based thereon is likewise improper. In re Glass, 176 U.S.P.Q. 489 (C.C.P.A. 1973).

Indeed, the present invention could not possibly have been obvious in view of the Gibco reference. This is because there is nothing in the Gibco reference that teaches or

suggests how nucleic acid may be quickly and easily purified onto a solid phase directly from a crude liquid starting material (with improved binding, minimum contamination of the equipment, and ease of disposal of the waste), by drawing the starting material onto and through the solid phase in one direction, and then forcing it back across the solid phase in the other direction. Therefore, the Gibco reference does not suggest how to overcome the problems of the prior art purification methods described above, much less teach the non-obvious methods and devices of the present invention.

In view of the clear differences between applicant's extraction methods and devices, as claimed in claims 1-24 and 26-32, and those of the Gibco reference, the 35 U.S.C. §103(a) rejection of those claims based on the Gibco reference cannot be maintained.

In view of the present amendments and the foregoing remarks, it is respectfully requested that the objections and rejections set forth in the March 5, 2004 Official Action be withdrawn and that this application be passed to issue, and such action is earnestly solicited.

Respectfully submitted,

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